Congressional Notification Profile
DE-PS26-02NT41369

UNIVERSITY COAL RESEARCH PROGRAM, INNOVATIVE CONCEPTS PROGRAM
University of North Dakota

Background and Technical Information:
Project Title: "Advanced Heterogeneous Reburn Fuel From Coal and Hog Manure."

This project will develop and test a fuel made of pulverized lignite and hog manure, which, with a heating value of subbituminous coal, is expected to reduce nitrogen oxide emissions. About 10 percent of the reburn fuel will be burned with lignite at the university's pilot-scale conversion and environmental process simulator. A second test will combine a lignite slurry with raw hog manure to help quantify NO_x reductions achieved by hog manure processing. Lignite will be obtained from a western North Dakota mine and manure will be provided by a local sow operation.

Contact Information:

Selectee: University of North Dakota

Business Contact: Sheryl E. Landis

Business Office Address: UND Energy & Environmental Research Center
P.O. Box 9018
Grand Forks, ND 58202-9018

Phone Number: 701-777-5124 Fax Number: 701-777-5181
E-mail: slandis@undeerc.org

Congressional District: ND 1st County: Grand Forks

Financial Information:

Length of Contract (months): 12
Government Share: $50,000
Total value of contract: $50,000

DOE Funding Breakdown:
Funds: FY 2002 $50,000

ADVANCED HETEROGENEOUS REBURN FUEL FROM COAL AND HOG MANURE
University of North Dakota Energy & Environmental Research Center

Abstract

An advanced reburn fuel will be produced from hog manure and pulverized lignite. Processing will involve heating the manure with its inherent water content in a closed system at a relatively low reaction temperature in the presence of an alkali reaction promoter. The resulting product will be separated into its organic and aqueous phases. The organic fraction will be combined with pulverized lignite to form an advanced reburn fuel that will be tested in a pilot-scale combustion unit to determine the level of NOx reduction that is attained as well as operability information such as ease of feeding, the occurrence of fouling or slagging, changes in furnace operating conditions induced by the fuel, etc.

For comparative purposes, a second reburn test will be performed in which a slurry of pulverized lignite and raw hog manure will be introduced into the system (i.e., unprocessed) and the NOx level measured. Lignite will be obtained from a mine in western North Dakota, while the hog manure will be procured from EnviroPork, a 5000-sow operation that produces 110,000 piglets each year and is located approximately 30 miles from the University of North Dakota Energy & Environmental Research Center (EERC). The feedstocks will be characterized using proximate and ultimate analyses performed according to the ASTM standards for each.

Samples of the lignite and hog manure ash also will be analyzed using x-ray fluorescence analysis to provide a better understanding of their composition, especially with regard to alkali content. Processing of the hog manure will take place in the EERC's cold-charge autoclave system. The system will be flushed with N_2 to provide an initially inert atmosphere. Processing will be performed using an alkali catalyst at a temperature of 275°C for a reaction time of 60 min. Reaction pressure will depend upon the moisture content of the hog manure feedstock. Following quenching of the reaction and collection of the product gas for analysis, the liquid product will be separated into its organic and aqueous fractions.

Both the gaseous and liquid products will be characterized using analyses performed according to ASTM standards. Pulverized lignite will be slurried with the organic fuel produced from the hog manure so as to result in a reburn fuel with a heating value of nominally 12,000 Btu/lb. The resulting heterogeneous reburn fuel will be tested in an advanced reburning scenario in the EERC's pilot-scale conversion and environmental process simulator (CEPS) unit. In the first reburn test, lignite will be fed at a nominal rate of 5 lb/hr, and the reburn fuel will be introduced at a heat input rate of 10%.

On-line gas analyzers will monitor various flue gas components, including both fuel NOx and thermal NOx. The second reburn test will be conducted at the same conditions to evaluate the

Nox reduction achieved by a slurry of lignite and raw hog manure. The comparison of these results with data from the first reburn test will quantify the improvements in NOx-reduction ability due to the hog manure processing.

The EERC point of contact for coordination, preparation, and distribution of press releases is Barbara Steadman, who may be reached at (701) 777-5113 or by e-mail at bsteadman@undeerc.org.